ICAO's technical report on portrait quality

What is a passport good for?
Is "good enough" good enough?
Quality matters.

Gaithersburg, November 2018 | Dr. Andreas M. Wolf | andreas.wolf@bdr.de

AGENDA

- Status of the document(s)

- Application cases for MRTD portraits

- Some factors influencing quality

  - Distortion and distance

  - Inter eye distance

  - Glasses

  - Illumination and dynamic range

  - Makeup, hairstyle, head coverings

- Next steps

STATUS OF THE DOCUMENT(S)

- ICAO TR:

  - First draft dates back to 2014-09-05
  - Two Comment Resolution Meetings per year co-located alternatively with ISO/IEC JTC 1/SC 37 and SC 17/WG 3
  - Usually ~ 20 experts and ~ 70 pages of comments
  - 11th version submitted by NTWG to TAG at 2018-04-08
  - Meanwhile published at the ICAO Website

STATUS OF THE DOCUMENT(S)

See https://www.icao.int/Security/FAL/TRIP/Documents/TR%20-%20Portrait%20Quality%20v1.0.pdf

Gaithersburg, November 2018

For Publication on the ICAO Website

TECHNICAL REPORT

Portrait Quality

(Reference Facial Images for MRTD)

Version 1.0

April 2018

File: 2018_04_08 Portrait Quality
Author: ISO/IEC JTC1 SC17 WG3

STATUS OF THE DOCUMENT(S)

- ISO/IEC 19794-5: Information technology — Biometric data interchange formats — Part 5: Face image data

    - Edition 2005: All Amendments and Corrigenda have been consolidated, a corrected version was published 2016
    - Edition 2011: enriched with 3D and XML, not applied for MRTD

STATUS OF THE DOCUMENT(S)

- ISO/IEC 39794-5: Information technology — **Extensible** biometric data interchange formats — Part 5: Face image data

  - Project registered early 2017

  - Equivalent ASN.1/TLV and XML encodings

  - Up- and downwards compatibility

  - Comment Resolution Meeting for 2nd CD last week in Darmstadt

  - DIS planned for summer 2019

  - Publication planned for the end of 2019

STATUS OF THE DOCUMENT(S)

- Connection between ICAO TR and ISO/IEC 39794-5:

  - The ICAO Portrait Quality TR is splitted

  - Clauses 2-5 and 9 (and all Annexes) go to ISO/IEC 39794-5 as Annex B.1 and Annex E.*

  - Clauses 6-8 (image printing for submission, scanning of portraits, printing for MRTD production) go to Doc 9303

STATUS OF THE DOCUMENT(S)

- Integration timeline:

  - ISO/IEC 39794-1, -4 and -5 to be finalized in December 2019.

  - ICAO adopts its 9303 specification by April 2020.

  - ICAO refer to ISO/IEC 39794-1, -4 and -5 by December 2020.

  - Passport reader equipment ready to handle ISO/IEC 39794 data by 2025-01-01 (5 years preparation period).

  - Between 2025 and 2030, passport issuers can use the old or the new version (5 years transition period).

  - After 2030, passport issuers shall use ISO/IEC 39794.

- ISO is asked to maintain the 2005 version of standards until 2040, this requires extension from 2033 (as already confirmed by ISO TMB).

- This timeline is evaluated in 2022.

What are passports good for?

For sure:

- For passing borders at staffed gates.

- For passing borders at automated gates.

- As picture ID for official and private application cases.

All is **1-1**!

What else?

- Passport data base de-duplication?

- Comparison with visa data bases?

- Background search?

All is **1-N**!

Not to forget: Showing the document holder in a good shape?

SOME FACTORS INFLUENCING QUALITY

- Distortion and distance

- Inter eye distance

- Glasses

- Illumination

- Makeup, hairstyle, hair coverings

- (and many others)

All sample images have been copied from the ICAO TR. They all have been provided by the Australian Passport Office and Standards Australia. Without their support the creation of the TR would have been much more difficult.

DISTORTION AND DISTANCE

Table 3 – *CSD* requirements and recommendations.

Criterion: *CSD* for 1:1	Requirement	0.7 m ≤ CSD ≤ 4 m
	Best Practice	1,0 m ≤ CSD ≤ 2,5 m
Criterion: *CSD* for 1:N	Requirement	1 m ≤ CSD ≤ 4 m
	Best Practice	1,2 m ≤ CSD ≤ 2,5 m

- Why are there 1:1 and 1:N requirements?

- There was no consensus that one case is sufficient.

The maximum level of magnification distortion of the capturing process shall be set depending on the appropriate use case (see below).

- **1:1 use case:** At the border, an automatic and/or human facial verification/comparison is progressed. This is the case in most automated border control applications. The maximum magnification distortion rate of the picture in the passport **shall not be greater than 7%** and ideally **should not be greater than 5%**.
- **1:N use case:** At the enrolment or issuance time of the document, a 1:N facial identification is done on a database to help verifying the uniqueness of the identity associated to the new image provided. N is as large as the number of images searched. This use case requires higher quality enrolment. The maximum magnification distortion rate **shall not be greater than 5%** and ideally **should not be greater than 4%**.

DISTORTION AND DISTANCE

Figure 7 — a), b), and c) Good appearance. d), e), and f) Too strong magnification distortion.

DISTORTION AND DISTANCE

Figure 8 — Sample portraits taken with a full size sensor camera at focal length 50 mm from distances of a) 30 cm, b) 40 cm, c) 60 cm, d) 70 cm, e) 80 cm, f) 100 cm, g) 150 cm, h) 200 cm, and i) 250 cm. These images have been captured using the enrolment bench described in Annex F. All images have been normalized to a constant IED. The red bars mark the distance between the feature points 10.7 and 10.8 according to ISO/IEC 14496-2:2004 measured in Sub-Figure i).
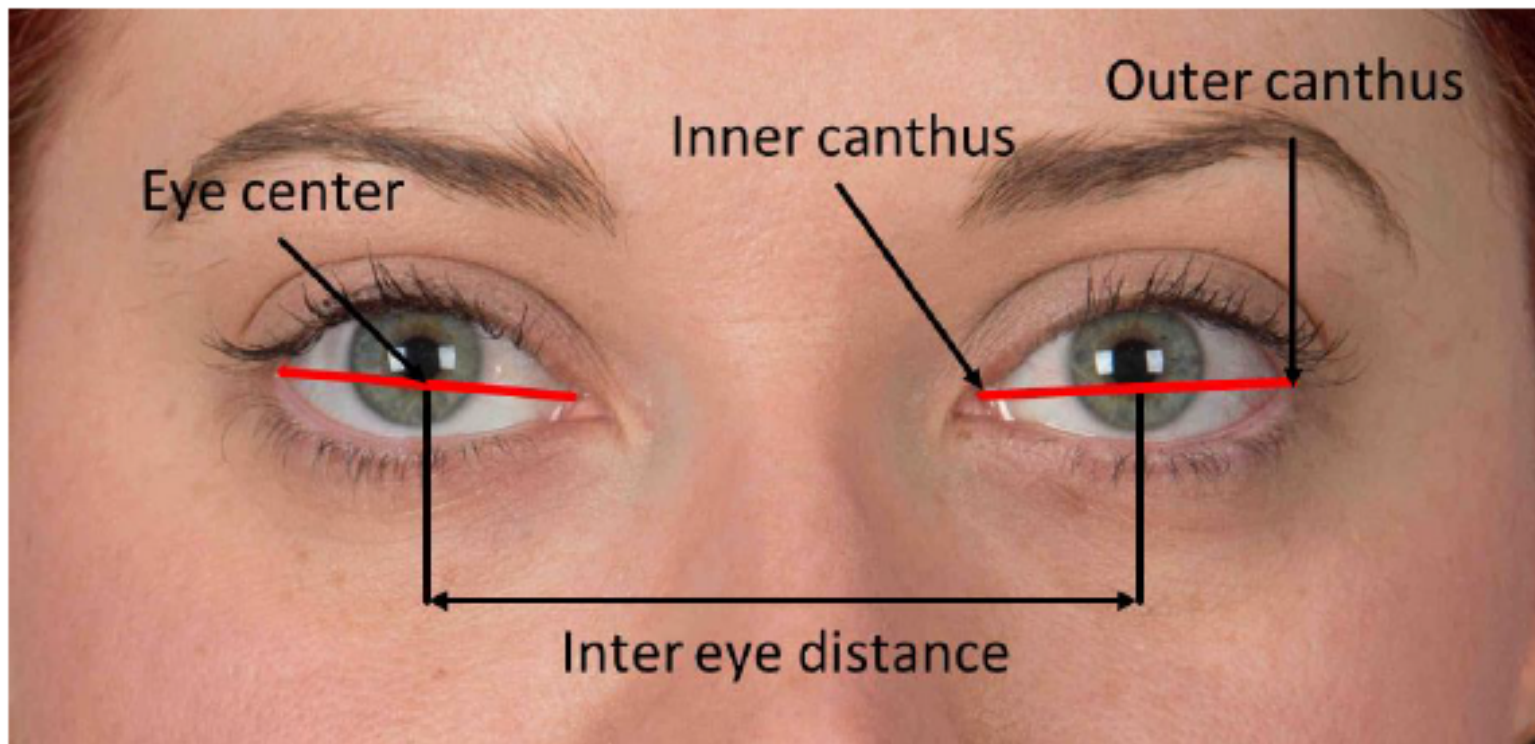
INTER EYE DISTANCE

Figure 11 — IED measurement.

INTER EYE DISTANCE

Table 5 – _IED_ capturing requirements and recommendations.

Criterion: Live Capture IED	Requirement	_IED_ ≥ 90 pixels
	Best Practice	_IED_ ≥ 240 pixels
Criterion: Scanned Image IED	Requirement	_IED_ ≥ 90 pixels
	Best Practice	_IED_ ≥ 240 pixels
Criterion: Electronic Submission IED	Requirement	_IED_ ≥ 90 pixels
	Best Practice	_IED_ ≥ 240 pixels
Criterion: Issuer Repository IED	Requirement	_IED_ ≥ 90 pixels
	Best Practice	_IED_ ≥ 240 pixels
Criterion: MRTD Chip Storage IED	Requirement	_IED_ ≥ 90 pixels
	Best Practice	_IED_ ≥ 120 pixels

- Different process steps require different image sizes.

- This has not (?) been considered so far, but it should be done in the future.

GLASSES

If glasses are permitted by the issuer, subjects may wear glasses during image capture if they typically do so.

Best compromise:

- No glasses during enrolment
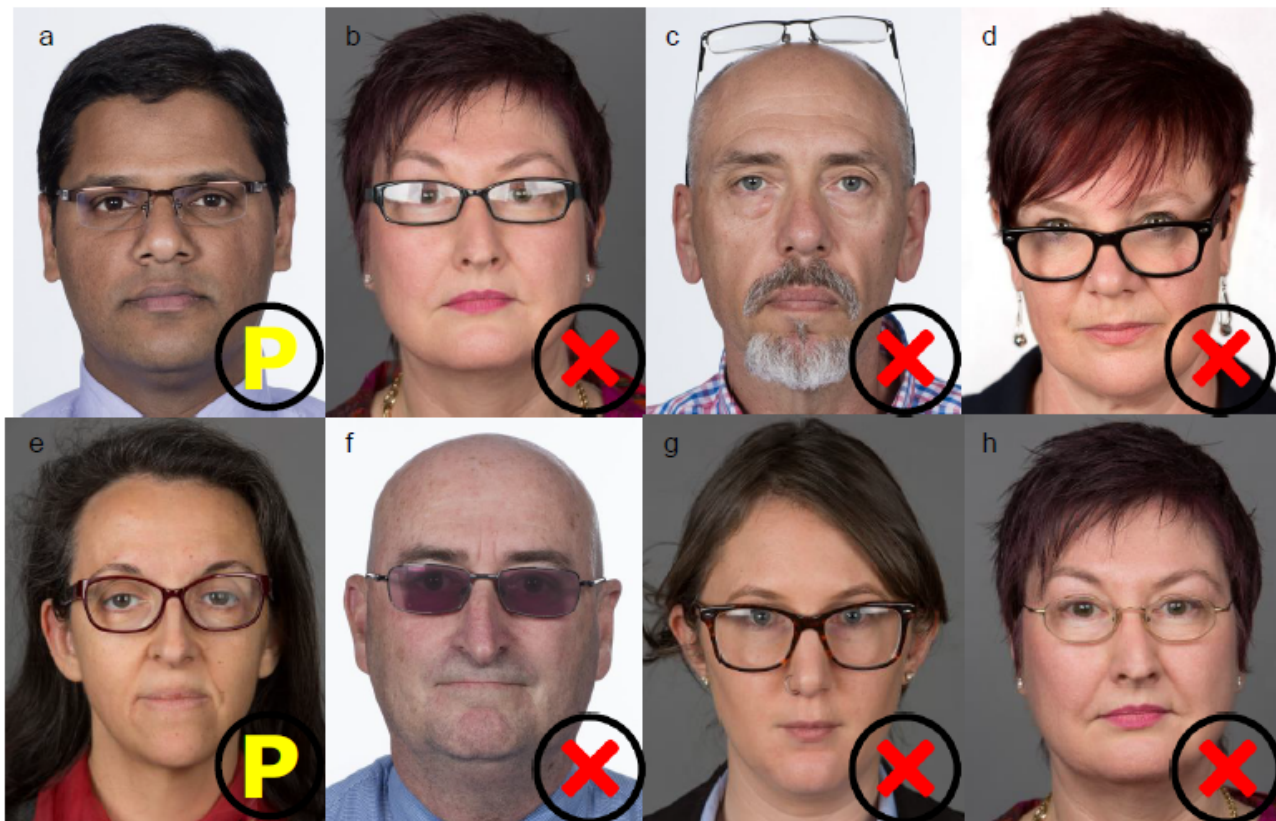
- Wear glasses at inspection time (if usually worn).

Figure 30 — a) Compliant portrait, b) Strong reflections on glasses, c) Glasses worn on the head, d) Frame crossing the eyes, e) Compliant image, f) Sunglasses, g), h) Frames partially covering the EVZ.
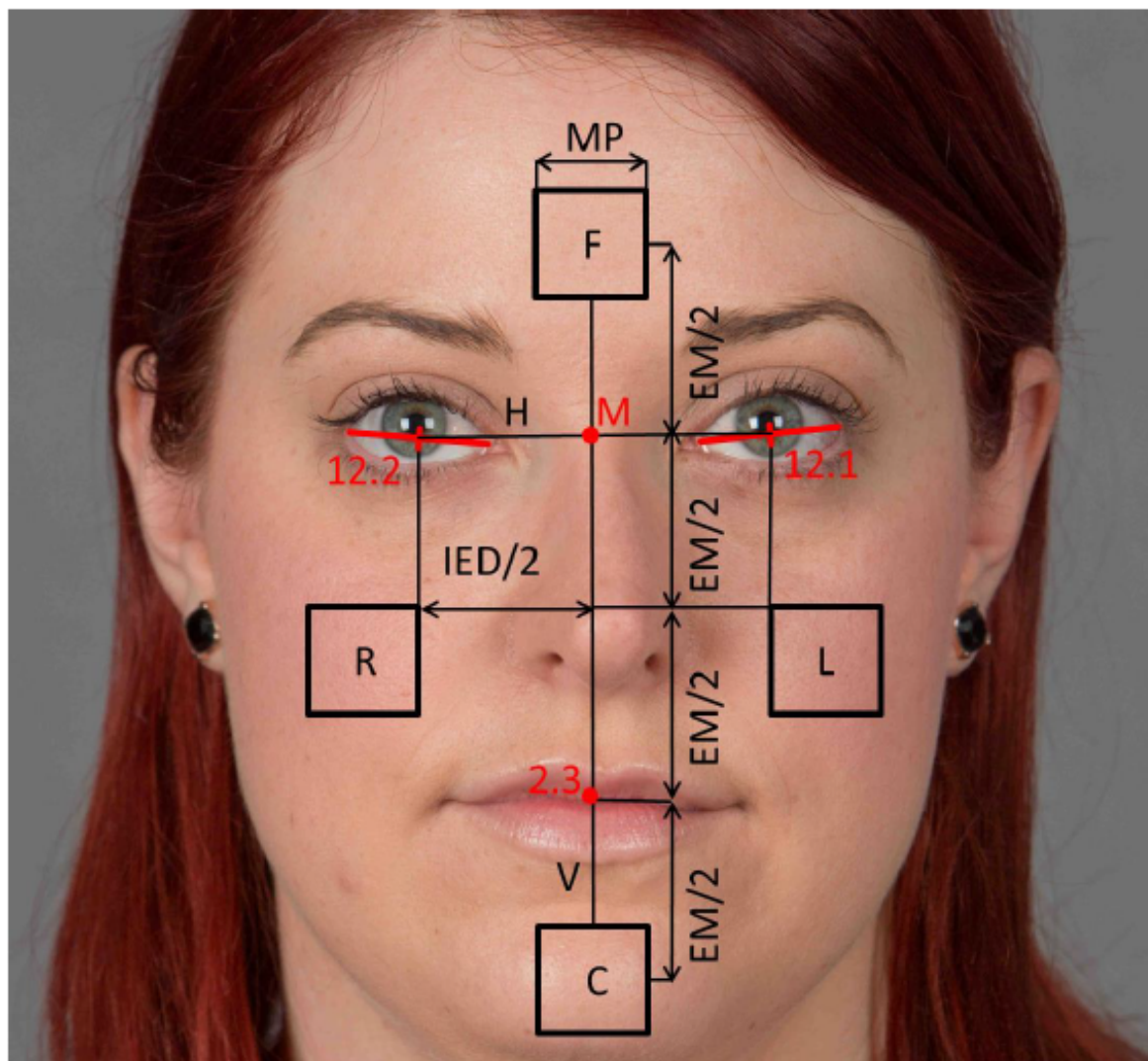
Figure 16 — Location and size of the intensity measurement zones.

ILLUMINATION AND DYNAMIC RANGE

- At least 50% of intensity variation in the facial region of the image.

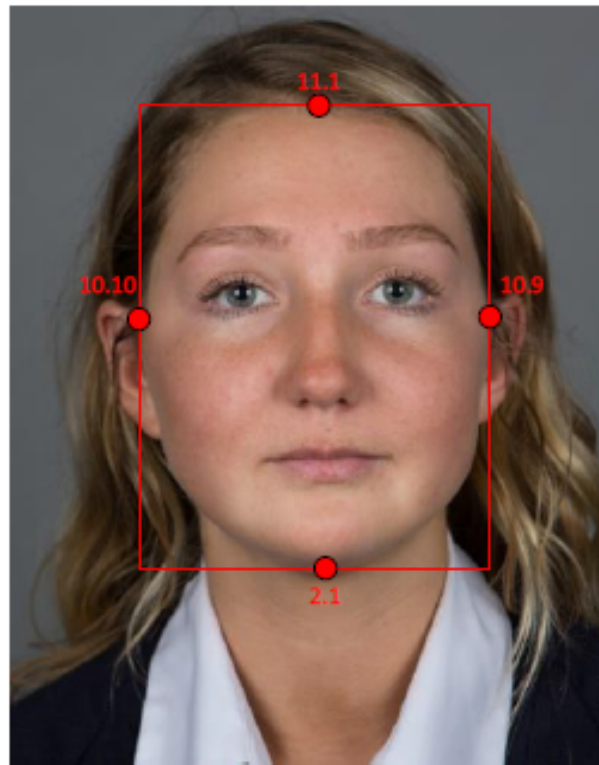- Adjustment of the equipment may be required when the skin tone is excessively light or dark.

Figure 19 — Illustration of the recommended dynamic range measuring zone.

MAKEUP, HAIRSTYLE, HEAD COVERINGS

- People usually try to look better than normal in an ID photo. In some extreme cases an excessive use of make-up affects computerized as well as human facial recognition capabilities. Therefore the subject should only wear typical every day make-up.

- What is typical every day make-up?
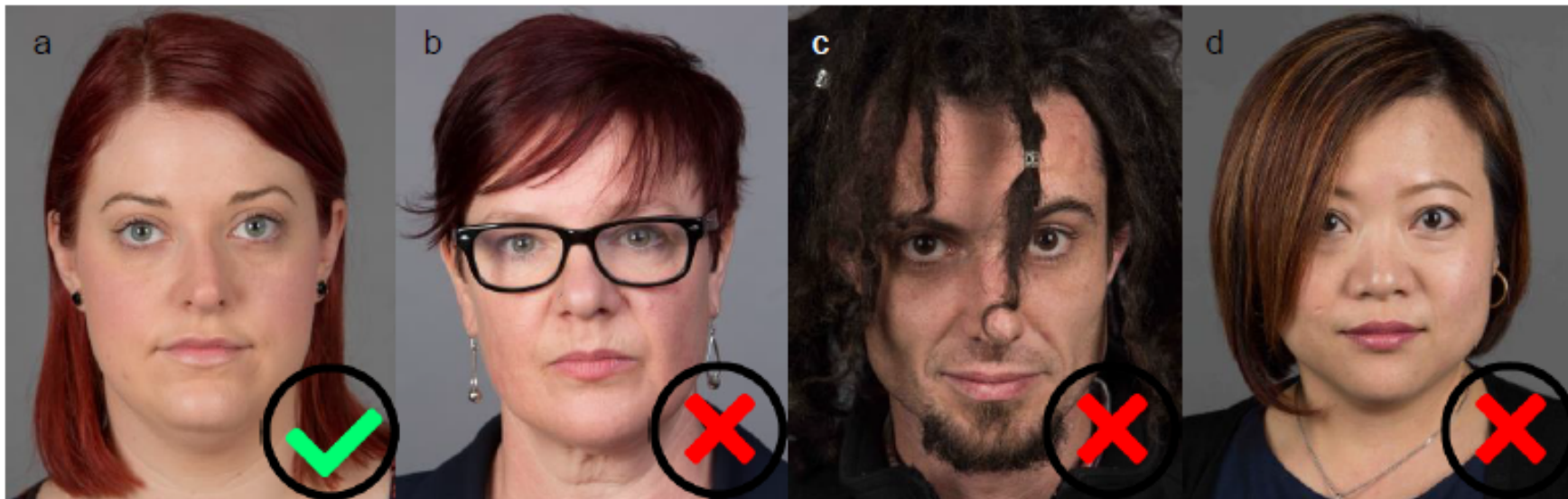
MAKEUP, HAIRSTYLE, HEAD COVERINGS

Figure 33 — a) Compliant portrait, b) Hairs and glasses close to the *EVZ*, c), d) Hair partly covering the *EVZ*.

- The face from crown to chin and from ear to ear shall be clearly visible.

- Coverings shall not obscure any facial features and shall not generate shadow.

- If head coverings are allowed, they shall be firm fitting and of a plain uniform color with no pattern or no visible perforations.

Figure 31 — a), b) Compliance depends on issuer policy, c) Face not completely visible, d) Non-uniform head covering, e), f) Low background contrast, g) Compliance depends on issuer policy, h) Visible perforation, i) Non-religious head coverage.

NEXT STEPS

- Application of the TR in national enrolment guidelines.

- Completion and publication of ISO/IEC 39794-5.

- ISO/IEC 39794-5 **allows** to encode much more data than in the past. The standard takes over the ICAO requirements to portrait quality. The **decision**, **what** data **exactly** shall/should/shall not be encoded in a data record to be stored in an MRTD needs to be made by SC 17/WG 3 and ICAO.

- Preparation of a transition guideline from "old" to "new", done in ISO/IEC TR 49794.

- Elimination of analogue intermediate steps?

- A similar profile than the TR, this time for verification images?

- As soon as more memory is available on MRTD hardware and reading speed increased: Larger inter eye distance? More than one image? Different distances? Half-sided view as in the past?

Thank you for your attention.

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